Reil Notes

(Twiggs, 1994). Twiggs argues that the widespread availability of self-paced learning materials will create a national learning infrastructure that will diminish the need for faculty designed courses and faculty-centered approaches to learning. The learner will no longer be guided by master teachers through "courses" of study. Instead students will independently access information from databases and multimedia sources to complete learning modules they organize. This information delivery is linked to the idea of lifelong learning, learner-driven learning and project based learning.

Just-in-time learning is a phrase borrowed from industry to describe the changes that have taken place in the communication and delivery of learning resources. In its most radical form, it suggests that teachers will become less important as active learners will be able to locate what they need, when they need it, from a worldwide showcase of information.

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**(1) Learner-Control**

‘Just-in-time’ learning implies that the learner’s need is what drives the delivery of information. Educator reformers who use "just-in-time learning" are often those who advocate learner-directed, constructivist modes of learning in contrast to information delivery systems or programmed learning tutorials.

. In this system, students retrieve the information, but are unable to use it to solve problems or understand relationships. It is these shortcomings of the traditional system that are used to argue for an inquiry-based approach to learning. Constructivists argue that integrated learning directed by the students help them to understand why, how, and when to use information and tools (Springfield, Ross and Smith, 1996; Meier, 1995; Darling-Hammond, 1997; Ruopp, Gal, Drayton, & Pfister, 1993. Because students direct the learning, there needs to be access to extensive resources. Designing a comprehensive curriculum from multi-discipline, project-based activities is the challenge faced by many of the New American Design Schools, (Cohen & Jordon, 1996, Hunter, 1995, Goldberg & Richards, 1996; Campbell, et. al., 1996) as well as many online teacher development programs (Roupp et al, 1993, Math Learning Forums). What is missing in these descriptions is how the learner acquires the skill to be an expert consumer of learning resources.

Opponents of constructivist learning approaches claim that "learning-controlled," "project centered," or "theme based," instruction fails to provide strong content knowledge in any discipline. The result is that students do not know even the most basic elements of the different subject areas (Hirsh, 1996; Ravitch & Finn, 1987). Hirsch fears that these progressive ideas create an instructional context that lacks intellectual coherence. Instead, he calls for a more traditional approach to curriculum which emphasizes student mastery of a scope and sequence within a discipline--an ordered, logical sequence of foundational ideas, concepts and tools to be presented to students over a period of years. Basic skill educators are unsympathetic to constructivist notions that suggest the learner should control education. They place the teacher and national or state agendas as the central force in directing the course of learning.

Computers linked to the Internet provide this flexibility of access because it connects to vast collections of information and tools. Any group or individual can make digital information (photos, sounds, text, images) available to anyone who wants this information, at any time, and from any place. This is the feature that leads some to suggest that teachers will no longer be needed to organize the learning experience (Craig, 1966; Twigg 1994). The claim is that students will "learn how to learn" and will be able to pursue their interests and projects independently, with little need for teachers.

It is this claim that just-in-time learning will make teachers obsolete that is challenged. Ready access to rich informational resources from many different perspectives *increases* the need for skilled educational direction from teachers. Students need to learn how to evaluate information and information sources, what other resources are available, and how their work integrates with that of others to create a comprehensive understanding of a field of study. Creating cross-discipline, project based learning requires exceptionally talented teachers who understand the scope and sequence of each discipline well enough to make sure that students are receiving a comprehensive education. Those who argue against constructivist learning have some valid concerns. However, the solution is not a return to "basics"--information delivery education. What is needed, instead, is a move forward to basics integrated with rich interconnected projects within knowledge building communities (Scardamalia and Bereiter, 1994, 1998).

We need to create learning communities that will make it possible for many more people to participate in classroom interactions. Acknowledging the power of flexible, on demand learning tools and technology, this papers presents a very different structure for their use from that of many who advocate just-in-time learning.

But knowledge is about reflection and debate as much as it is about solving practical problems efficiently. Knowledge is not built from the needs of individuals; it is a process of weighing many different perspectives, of thinking beyond what is needed for the current activity. Information resources need to be examined from the multiple perspectives of the community and analyzed in ways that lead to comprehensive integrative learning.

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At a deeper level, though, this enormous amount of information ultimately increases our dependence on each other. The Internet contains far more data than any one person can read, evaluate or use. We need to be a part of learning communities to build knowledge in ways that help us understand our world.

In the traditional model, the teacher sets the course of learning (based on school, district and national frameworks) for a class of students who can all be taught, for the purpose of instruction, the same content and in the same way. Traditional classrooms operate on the implicit assumption that the teacher is dealing with each independent learner, but in a group context.

With the knowledge base rapidly expanding, the traditional model of teaching and learning is at a breaking point. There are far too many students for one teacher. There is far too much content for any single teacher to master. The tensions in this model are different at different levels of schooling. In elementary schools, where the focus is on the learners, the tension appears in finding a single teacher who can provide rich, extensive, multi-subject learning experiences. In the secondary education, the tension results from have a large number of single subject teachers working with different groups of students hourly. In these schools, class members are grouped by age and ability to be as similar as possible. They are expected to work independently to master the content in the curriculum.

This traditional model no longer serves the needs of a society rich in information and in need of citizens who know how use diverse talents in concert to solve complex problems. Just-in-time learning suggests that students can work more independently with less need of teachers. Instead, I argue that technology contributes to more *inter*dependecy then *in*dependence and a need for more skilled teachers

Rather than using new communication and computer technology to further individualize learning, classrooms can be organized into learning communities with students, teachers, and community members all playing vital roles in directing the course of education. The premise that just-in-

This grouping of students is an effort to create a homogenous class so that a teacher can talk to each student as if they were the only person.

Students do not naturally fit into this rigid structure. They are different. They begin school at different ages, some with very different backgrounds and experiences, and all with unique strengths and weaknesses. They learn at different rates and need to have different experiences.

Community of practice defined

Knowledge construction in our society is rarely done in isolation. People in a field work together building on the ideas and practices of the group. Culture and cognition create each other (Cole 1985). Learning increasingly takes place in "communities of practice" (Lave & Wenger, 1991; Ruopp, Gal, Drayton, & Pfister 1993; Pea & Gomez 1994; Dunbar, 1996). A community of practice is a group of people who share a common interest in a topic or area, a particular way of talking about their phenomena, tools and sense-making approaches for building their collaborative knowledge, and a sense of common collective tasks. These communities of practice may be large, the task general, and the form of communication distant, as in a group of mathematicians around the world developing math curriculum and publishing their work in a set of journals. Alternatively, they can be small, the task specific, and the communication close, as when a team of teachers and students plan the charter of their school.

Learning communitities defined

." Learning communities share a way of knowing, a set of practices and shared value of the knowledge that comes from these procedures. Communities support different ways for novices and experts to work in the same system to accomplish similar goals. Community members are recognized for what they know as well as what they need to learn. Leadership comes from people who can inspire others to accomplish shared goals.

Learning communities recognize that students arrive with different skills, at different ages, with different experiences and interests and build this diversity into the learning context. In a learning community, students learn to work in teams and learn how to make teams work. The accomplishment of the team is primary and each member of team contributes in some way to the outcome. This makes students in a learning community *inter*dependent. They build from each other’s strengths develop a sense of competence and empowerment in areas where they are most motivated or skilled, and can pull others who are weaker in these areas up with them. Distributed knowledge is a building block for such learning communities. (Levin, Riel, Miyake, & Cohen, 1987; Brown and Campione, 1994; Pea and Gomez, 1994; Pea, 1994, Dunbar, 1996, Levin 1977).

When students are participants in learning communities that include a network of people who organize around a specific issue, problem, or debate, the resources and direction of the learning are less predictable. If the learning community is exploring the origins of human behavior or the shape of an equation, they are not limited to the people who are in the room who are all at the same "level" of understanding. The inclusion of many people with differing expertise makes the direction of the community neither under the complete control of the teacher, nor under the complete control of the learner. Instead, the control of learning is an interactive process that develops as the community works together to create shared understandings. All members of the community, including the teachers, are learners and teachers model skilled learning.

Internet technology provides a rich format for the larger community to participate in the education of the next generation

Transforming the classroom into a learning community makes it possible for many more people to be a part of the learning process in an open and continuing dialogue.

In the past decade, the tools for learning have significantly changed. These tools, in turn help to create an image of how the learning environment will change (Riel, 1997). Not only do they bring students different resources, (pictures from Mars, transcripts of global news conferences, newspapers from around the world, images from live cameras), but these tools make it possible for students to learn in different ways. Students are currently engaged in group projects that are very difficult or impossible with the resources found in traditional classrooms. No single person can provide the rich complex of knowledge and skills that might be needed by a community of students. A good library can provide some of these resources but computer and communication technology multiplies the possibilities.

A new set of educational tools will not, by themselves, provide the wide systemic perspective that characterizes quality education. These tools can make it possible for students to participate in communities that extend beyond their school building. Skillful teachers will need to help students learn how to evaluate information and information sources and to place what they are learning within the larger context of intellectual development.

With access to the Internet, primary source data of all kinds can form the basis of instruction and research economically. With the help of these and other multi-media resources, teachers can use primary sources in their classroom presentations. Instead of worksheets that reinforce the secondary interpretations of textbooks, teachers can design student projects and study questions that encourage students to develop analytical and interpretive skills. All

Linear texts are increasingly being replaced by hypertext with links to extensive information. Students with access to encyclopedias on the computer have tools for finding information that would have been difficult to locate in the past

The above may be a reason that computer texts re more helpful for students who are included??

Students can use hypertext to organize their learning, but they can also use hypertext as a form of expression. Writing in hypertext is a new skill. It is conceptually different then sequential writing. It allows for a different form of interaction between author and reading and larger communities of people. Writing collaboratively with a larger community of people who care about a topic is a powerful lesson in group problem solving and thinking (Scardamalia & Bereiter, 1994).

). They are learning to write in a format that is integrated with other forms of expression including color, formatting, graphics, photography, audio, and video. These skills are increasingly valued as the ability to work with current technological advancements require specialized communication skills such as graphic design and multi-media hypertext and video production. These are the "basic" skills for the communication age.

. Projects designed today, using the computer as a research tool, send students into the physical and social world to collect observations, measurements, surveys, and other data using appropriate scientific tools. Telecommunication networks make it possible for them to then exchange, analyze, and discuss this information with their peers from around the world. In the

As computers become smaller and more portable they become valuable field guides and research tools in the laboratory and in the field. Students can use microcomputer-based measurement and monitoring devices for collecting and analyzing data (Rohwedder & Alm, 1997). Using laptop computers and a set of monitoring devices, students can collect, record and graph their data on temperature, relative humidity, light intensity, pressure, and voltage right on the spot. More in-depth analysis and descriptions can occur back at the school site.

With better access to resources, students can become experts on different topics. They can share this expertise not just by completing assignments given to the teacher, but by creating resources for others’ learning, using today’s technological production tools. Powerful examples of this can be seen in the library of websites created by students as part of the [ThinkQuest Contest.](http://io.advanced.org/thinkquest/tq97.winners.html) Since it 1996, students from around the

The tools that are new making a difference in classroom are those that help students to connect and create.

Look Up

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